Game Changing Development

Phase Change Material (PCM) Heat Exchanger Development

Completed Technology Project (2013 - 2017)

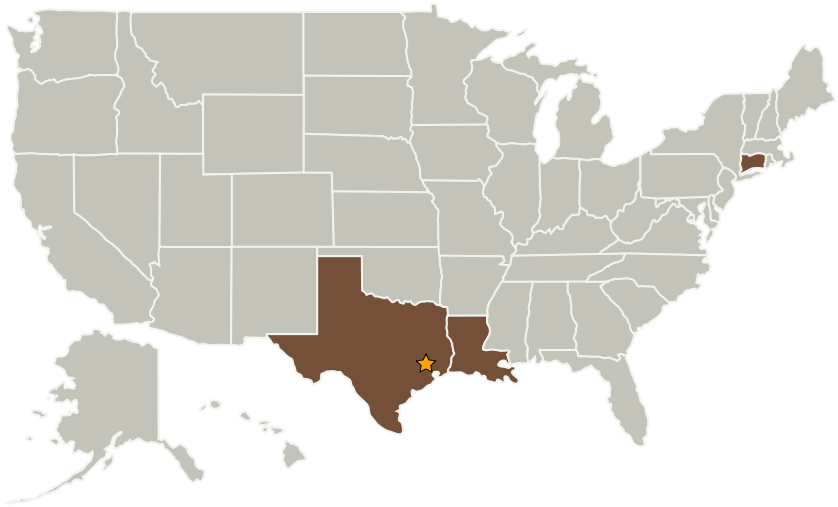
Project Introduction

The primary focus of the project is to provide future space vehicles a reliable form of long duration supplemental heat rejection (SHREDs). SHREDs allow a vehicle to reject waste energy when nominal means do not allow so. The project is investigating, through partnerships with UTC Aerospace and Mezzo Technologies, the use of wax and water based PCM Hx. The project will culminate with a technology demonstration on ISS.

Anticipated Benefits

NASA funded: The project has identified two PCM Hx concepts that have paths for possible infusion to future vehicles such as Orion. The project includes development and an eventual technology demonstration on the International Space Station (ISS). The first heat exchanger is wax-based and has reached a TRL of 4. The project will build a wax-based PCM Hx in partnership with UTC Aerospace for flight demonstration on ISS. Testing a wax-based PCM Hx in a relevant environment will allow an "off the shelf" option for future vehicles, such as Orion, that require long duration supplemental heat rejection.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

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Primary U.S. Work Locations	
Connecticut	Louisiana
Texas	

Project Transitions

October 2013: Project Start

June 2017: Closed out

Closeout Summary: The wax PCM achieved TRL5 after completing testing on t he ISS in a relevant environment. However, the wax PCM did not meet its thres hold value for the mass fraction Key Performance Parameter. The water PCM ac hieved TRL4 after completing testing in the lab. The PCM project extended the p erformance capability of heat sink thermal management technology for in-space applications. The project focused on establishing the capability of using a paraffi n system which has system design and thermal transport benefits over existing systems being used on the International Space Station (ISS), A PCM was develo ped and successfully demonstrated on board the ISS in an experiment to prove out predicted microgravity operation and operational capability. The ISS flight e xperiment was designed to be a subscale demonstration of an anticipated Orion PCM heat sink system and was successfully tested from August 2016 through M ay 2017.

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

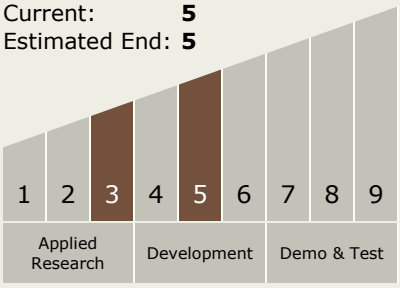
Program Director:
Mary J Werkheiser

Program Manager:
Gary F Meyering

Principal Investigator:
Rubik B Sheth

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Target Destination

Foundational Knowledge